

**DIABIT**

**GK23A**

# **ULTRA MAXBIT**

User's Manual



**MITSUBISHI**  
MITSUBISHI MATERIALS

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### SAFETY WARNING

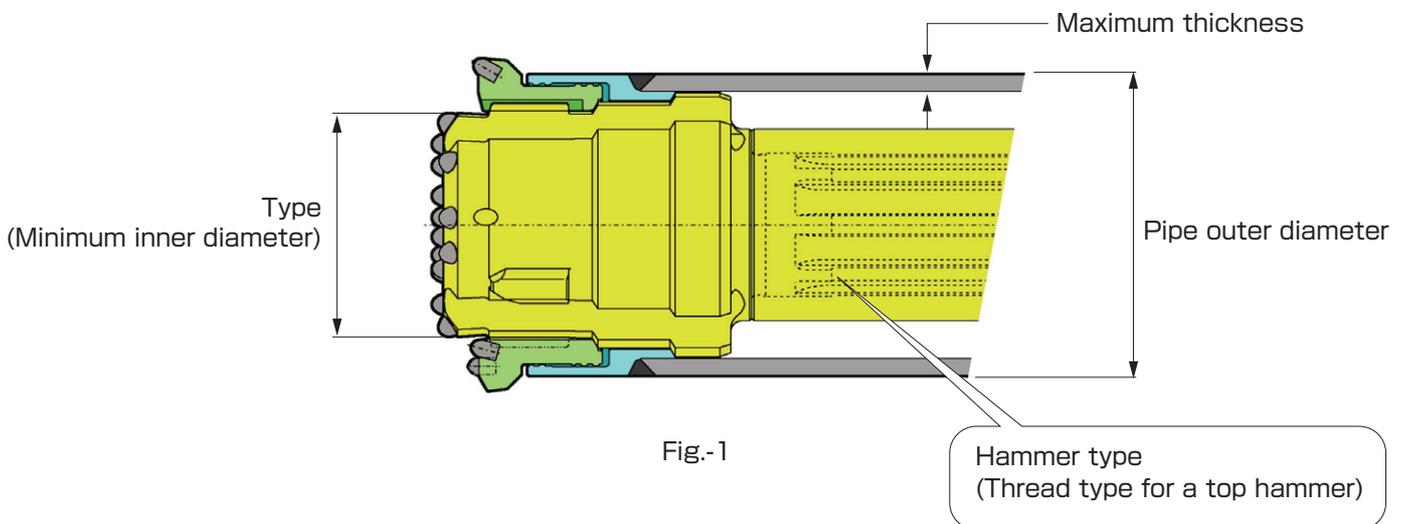


- During use, there is a likelihood of tool failure, take appropriate safety measures.
- This product contains or produces chemicals known to the State of California to cause cancer, such as cobalt (7440-4-84) (Proposition 65, California Health and safety Code Section 25249.5 et seq.) Refer to the applicable material safety data sheet.

## ◆ Selection of ULTRA MAXBIT

When selecting a type of ULTRA MAXBIT, make sure that the type of the system (equal to the minimum inner diameter of a ring bit) and casing pipe size (outer diameter and maximum thickness) are appropriate to your construction plan. Then select the most appropriate ring bit type among three types.

For dimensions of each type, refer to the catalog of the ULTRA MAXBIT. If you would like to order a specialized size, please fill out the order sheet attached to the manual and contact the contact person of MITSUBISHI Materials.



### Models of Ring Bit and Usage

#### Single pass

This is used when the depth of drill is shallow and casing pipe is not removed.

[Usage] Piling work

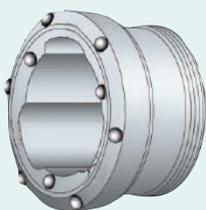


Fig-2

#### Normal

This is used when the depth of drill is deep and casing pipe is not removed.

[Usage] Well drill work, scout boring

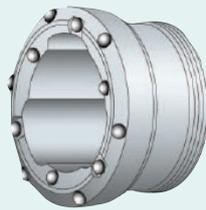


Fig-3

#### Multi use

This design reduces pulling resistance at recovery so that a casing pipe and ring bit can be used repeatedly.

[Usage] Anchor work, foundation construction

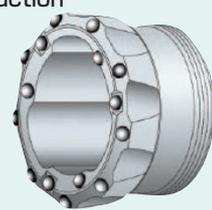


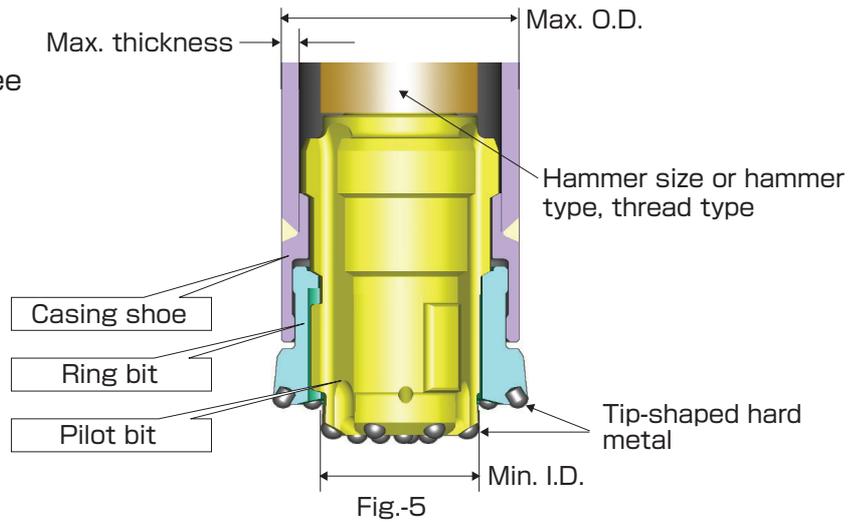
Fig-4

## ◆ System Code and Product Code

The ULTRA MAXBIT is composed of three components

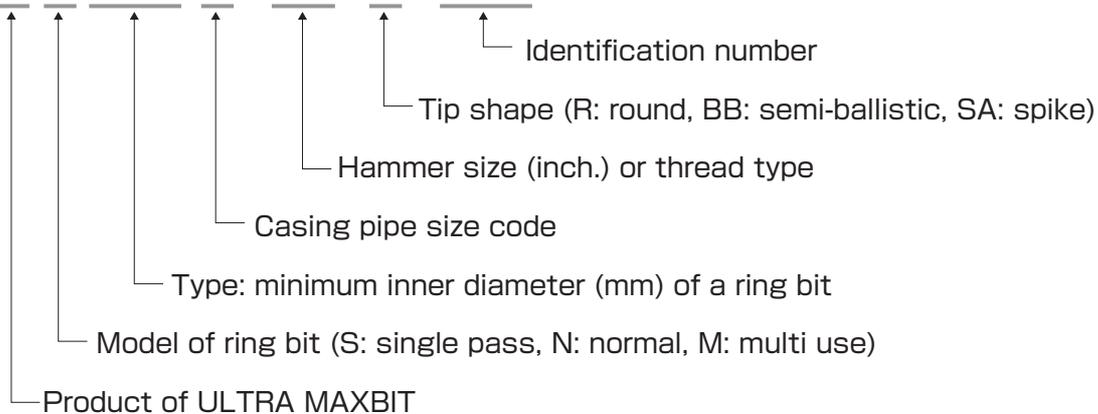
- (1) PILOT BIT
- (2) RING BIT
- (3) CASING SHOE

ULTRA MAXBIT is designed for several different casing pipe diameters  
To find the correct product, please refer to the "System code" and "Product code" shown below



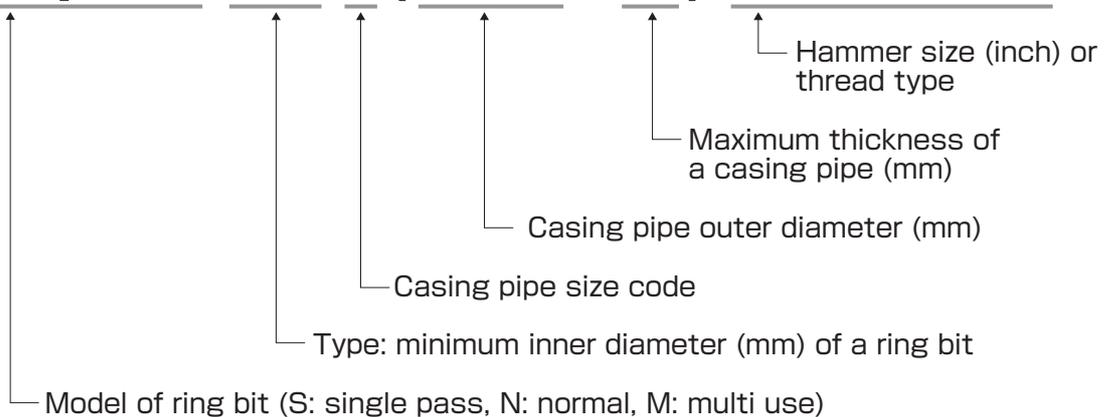
### System code

e.g.) **US097A-04-R-037**



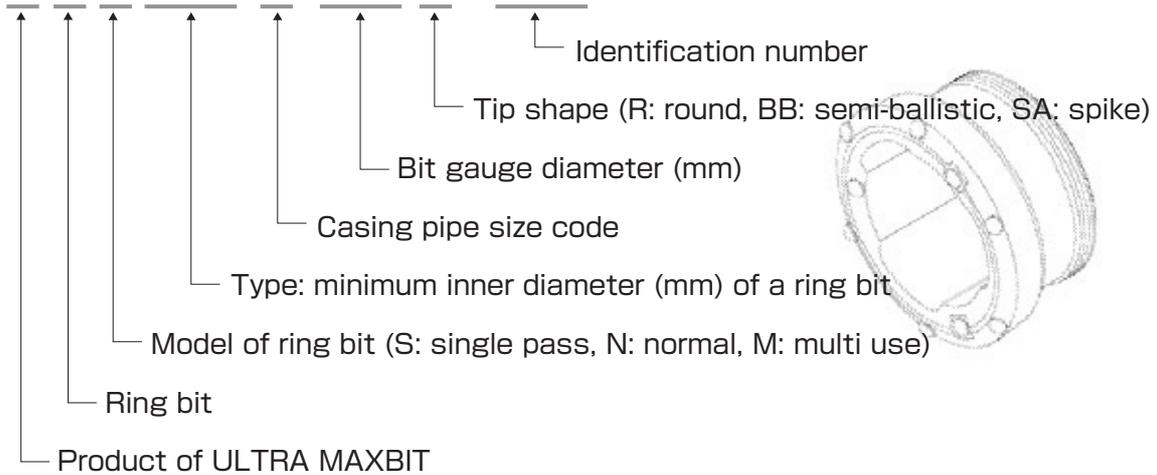
### System auxiliary code

e.g.) **Single pass 097A(139.7x10)-4"hammer**



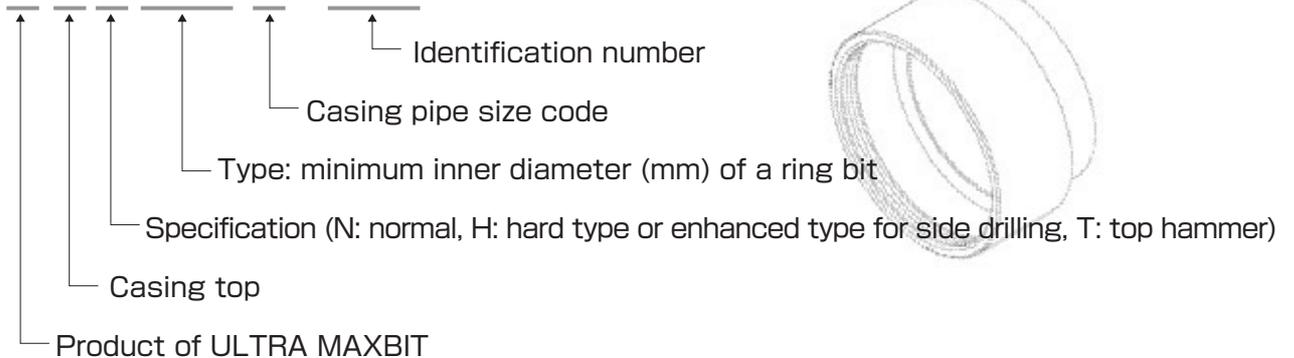
### Product code of ring bit

e.g.) **URS097A150R-025**



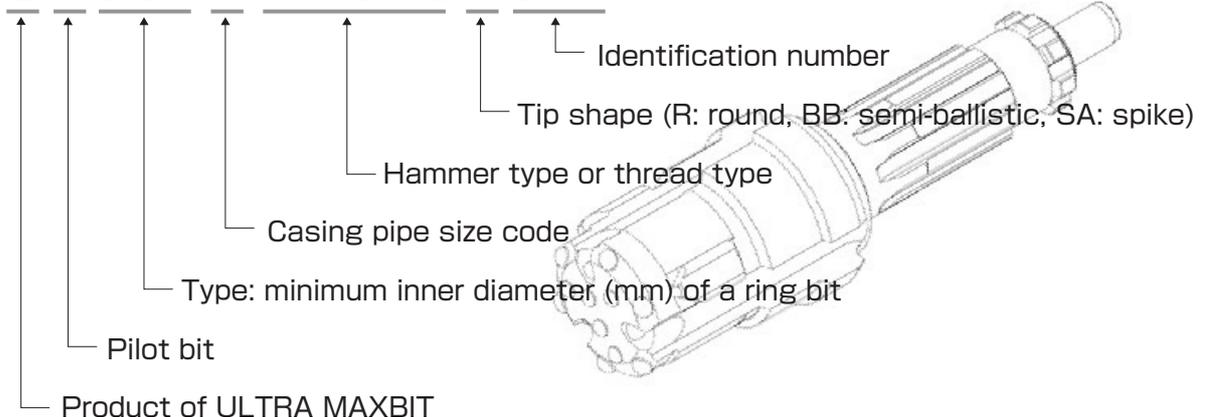
### Product code of casing shoe

e.g.) **UTN097A-001**



### Product code of pilot bit

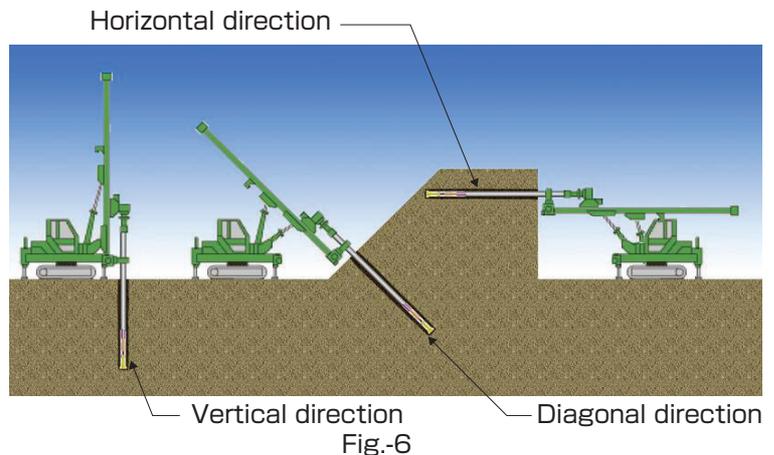
e.g.) **UP097ADH340R014**



# ULTRA MAXBIT

## ◆ Usage

The ULTRA MAXBIT can drill vertically, horizontally, and diagonally. To drill efficiently, adequate flushing is required. Auger Rod is recommended.



### Usage: Steel pipe pile foundation construction, pipe roof construction, steel pipe end acceptance construction

The ULTRA MAXBIT has several uses.

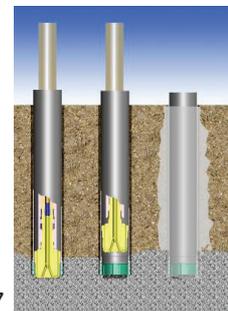
\*The drill rod may be left in the hole (foundation pile)

\*May be used for impregnating surrounding ground with chemical solutions

In these applications, a single pass bit is used.

《Construction process》

- 1) Drilling
- 2) Retrieve the pilot bit
- 3) Infuse the chemical solution to improve the ground



1) 2) 3)

### Usage: Water well, earth thermal exchange well

The ULTRA MAXBIT may be used to install casing (collar pipe) in badly fractured ground. In this application, a normal bit is used.

This operation is carried out in the following sequence.

\*Drill hole with ULTRA MAXBIT combined with casing

\* Continue to drill hole until solid ground is reached

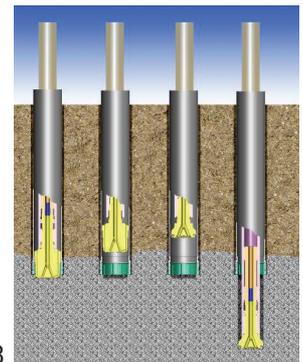
\* When hole is in solid ground, retrieve the pilot bit, leaving the casing and ring bit in the hole

\* Change to a smaller diameter conventional DTH bit, and continue drilling to complete the hole in solid ground.

\* Smaller diameter DTH bit enables drilling past casing and ring bit.

《Construction process》

- 1) Drilling
- 2) Retrieve the pilot bit
- 3) Insert the single bit
- 4) Drilling



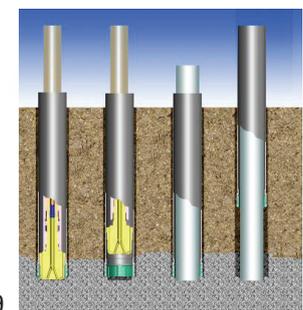
1) 2) 3) 4)

### Usage: Temporary work, anchor work

The hole is drilled through the broken ground and the casing is used to install the foundation materials. After this operation is complete, the casing pipe is removed and can be re-used. In this application, a multiple use bit is used.

《Construction process》

- 1) Drilling
- 2) Retrieve the pilot bit
- 3) Set the foundation materials
- 4) Retrieve the casing pipe



1) 2) 3) 4)

## ◆ Welding Casing Shoe

The casing shoe must be correctly welded to the casing in order to carry out successful casing drilling. If the casing shoe is not welded accurately to the casing, mis-alignment will result. This can cause the following problems.

- (1) Hole deviation
  - (2) Damage to the casing
  - (3) Damage to the shoulder of pilot bit.
- \*If these problems arise, the recovery of the pilot bit may not be possible

Chamfer the end of the casing at an angle between 30 - 40 degree (FIG10)

In very difficult broken ground, the following additional operation should be carried out.

Cut a radius of 15 - 20 degree at the following intervals.

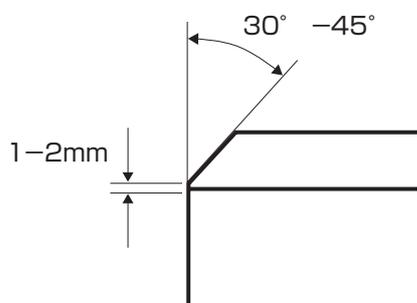


Fig.-10

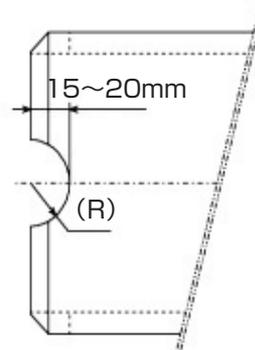


Fig.-11

4" Casing or smaller: 2 Radius cuts  
 8" Casing or smaller: 4 Radius cuts  
 Larger than 8": 6 Radius cuts  
 (Refer FIG11)

### Caution

Ensure that all surfaces to be welded are perfectly clean and free from any contamination including moisture.

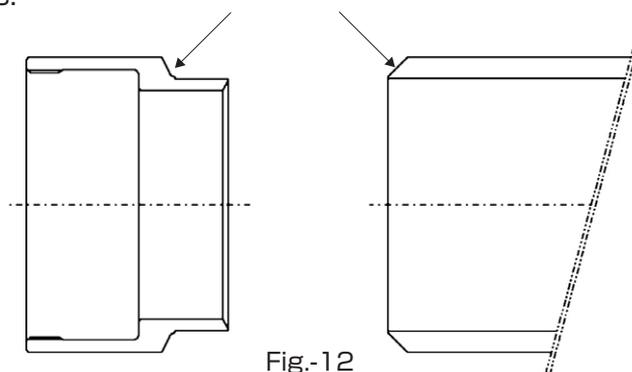


Fig.-12

The casing and casing shoe consists of different materials, caution must be taken when welding these items so that weld cracks are not generated.

**Metal components of casing Shoe: S45C (SAE No.1045)**  
 C:0.42-0.48 Si:0.15-0.35 Mn:0.60-0.90 P:<0.30 S:<0.35  
 Cu:<0.30 Ni+Cr:<0.35

Select a low-hydrogen solvent for the casing shoe welding. Pre-heat and post-heat the chamfer of the casing shoe before and after welding respectively.

Recommended weld solvent: JIS D4313/AWS E7016, JIS YGW11/AWS ER70S-G

Pre-heat: Preheat the groove of the casing shoe to 300°C.

Post-heat: Post-heat it to approx. 600°C and cool it down gradually (Heat it from 300 to 500°C slowly.)

Take sufficient time to weld them temporarily not to cause a weld crack due to sudden heating or cooling.

Weld them in the diagonal order as shown in Fig. 13.

Completely remove the slag during the temporary welding.

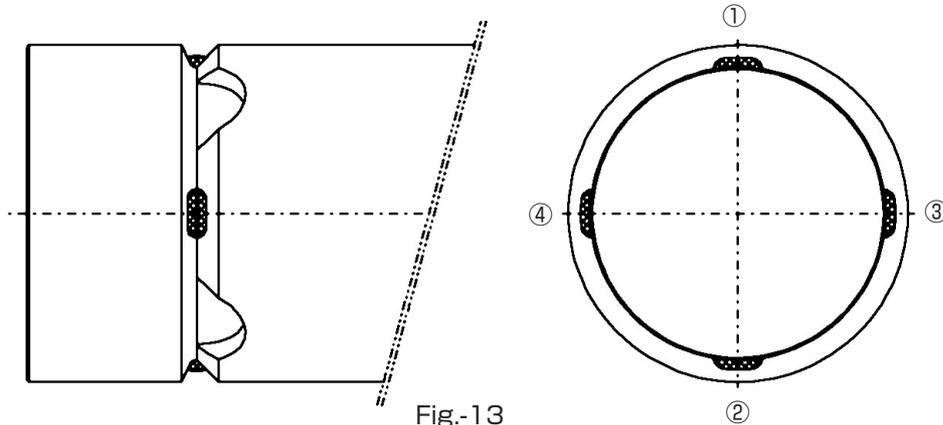


Fig.-13

Ensure that sufficient weld is applied to both casing and casing shoe, and excess weld is built up. Finally grind off excess weld from outer diameter of casing.

\*If excess weld is not removed, it will interfere with smooth installation of the casing.

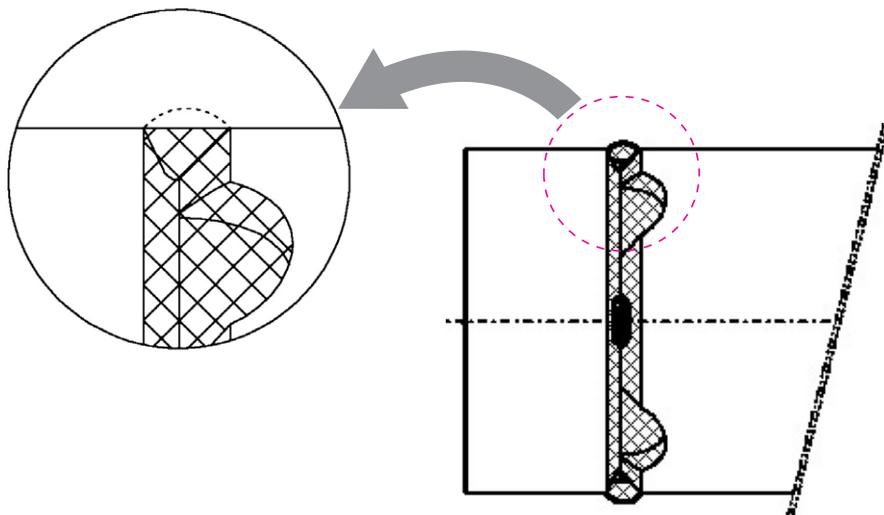
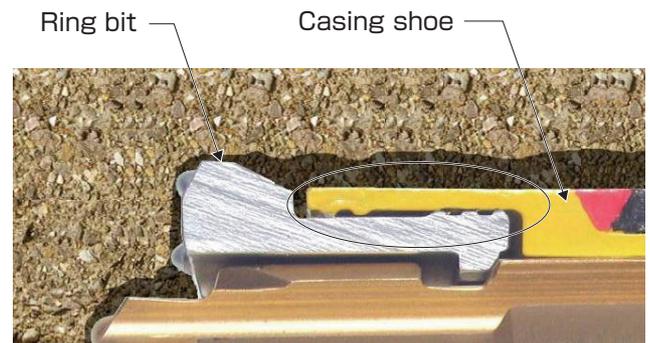


Fig.-14

## ◆ Attaching Ring Bit

The ULTRA MAXBIT system adopts a simple and user-friendly method, which is to couple the ring bit and casing shoe with a thread.

Attachment of the ring bit is completed only by fitting the thread to the casing top pre-welded to the first casing pipe.



Pic.-1

### «Down-the-hole hammer specification»

Most of the down-the-hole hammers rotate clockwise. The ring bit and the casing shoe are fit with left-hand threads.

### «Top hammer specification»

Most of the top hammers rotate counterclockwise. The ring bit and the casing shoe are fit with right-hand threads.



Pic.-2

### (Caution)

- Do not apply a grease. Sand may be caught by the grease.
- Check the nominal type on the sticker attached on the product.  
A product with a different nominal type can not be used.



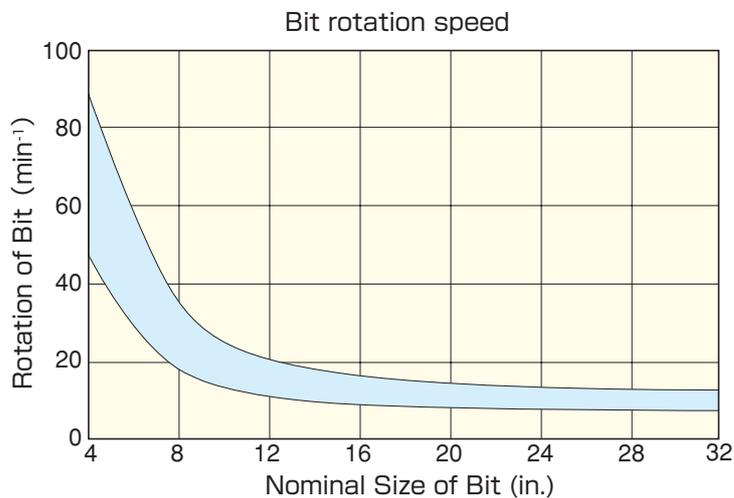
Pic.-3

## ◆ Setting Use Condition

The ULTRA MAXBIT is used for simultaneous casing drilling in disintegrative poor ground. Adoption of a double-pipe bit system enables the system to apply to a broad range of geological conditions such as a sand layer, weak layer, and boulder layer. The following drill conditions are recommended.

### Rotation Speed of Bit

Standard speed is 15~20m/min. Refer to the following figure for rotation. Select the range of uniform rotation during drilling.



### Condition of Compressor

- Pressure
  - ◆ Set between 0.7 and 1.0MPa (100~150psi)
  - ◆ Consider the depth of underground water when drilling through the layer. (In case of 30m(90ft) depth, add 0.3MPa (45psi) to the air pressure.)
  - ◆ Do not set over 1.5MPa (225psi)

- Air Supply
  - ◆ Set the air supply using the following formula.

$$Q = \frac{V (D^2 - d^2)}{1273500}$$

- Q : Air supply (m<sup>3</sup> /min)
- D : Inside diameter of casing (mm)
- d : Outside diameter of jacket or hammer (mm)
- V : Air speed 1,100 to 1,500 (m/min)

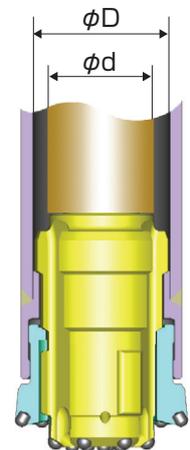


Fig.-15

## ◆ Procedure to Unlock and Relock during Drilling

The ULTRA MAXBIT enables the pilot bit and ring bit to be easily unlocked (separated) and relocked (reconnect) even during drilling. This mechanism facilitates a flushing action and enhances efficiency of the subsequent drilling. Follow the procedure below to unlock or relock the pilot bit and ring bit.

### Procedure to unlock (See Fig.-16)

- ① After drilling reaches a certain position, flush the hole while lightly moving the bit up and down with the bit locked.
- ② After the piston of the hammer starts operating, slowly rotate the ring bit counterclockwise one or two revolutions.
- ③ Raise the bit by 1 to 2m.
- ④ Perform the flushing action while rotating the bit clockwise.

**(Caution)**

- Raising the whole pipe with the bit locked may cause trouble in the locking system.
- If the ring bit is rotated counterclockwise rapidly in the step ②, inertia generated when the rotation stops gets the ring bit locked again. Likewise, if the clockwise rotation is stopped at high speed, the inertia may get the ring bit unlocked.

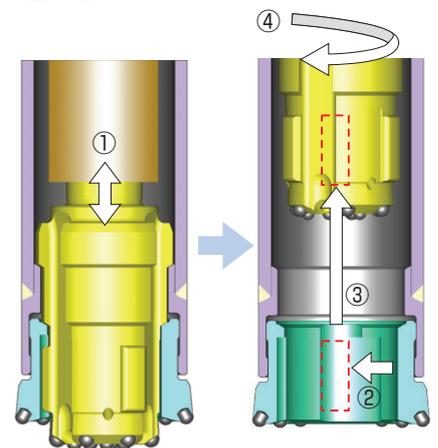


Fig.-16.Unlock

### Procedure to relock (See Fig.-17)

- ① Slowly lower the bit with the air supply stopped while rotating it clockwise.
- ② Rotate the bit several times after it is lowered to the bottom. Slowly raise the bit.
- ③ Confirm that the pilot bit and ring bit are locked. Supply air and restart drilling

**(Caution)**

- If the bit is lowered without stopping the air supply, the piston is operated and a spline of the pilot bit hits the ring bit, pushing it forward. Ensure that the air supply is stopped before lowering the bit. (See Fig.18.)
- Failure to relock can be caused by moving of the ring bit forward as shown in Fig.-19. Supply a small volume of air to operate the piston and lower the pilot bit so that the pilot bit and ring bit can be relocked.

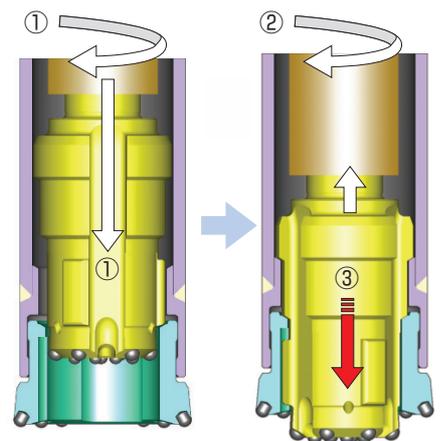


Fig.-17.Relock

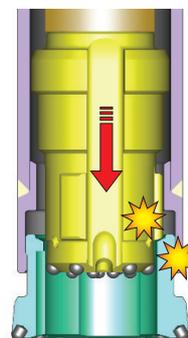


Fig.-18

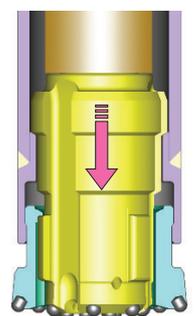


Fig.-19

## ◆ Checking Wear at Pilot Bit

The pilot bit has roles such as receiving energy (percussion, rotation, and feed) supplied from the drilling machine, drilling the ground the face of the bit, and transmitting the energy to the ring bit and the casing shoe (See Fig.-20). As shown in Pic-4., wear at the face of the bit and at the parts to transmit the rotation and percussion energy to the ring bit progresses across the edge, and eventually the pilot bit reaches the end of its usefulness.

Continuously Using the bit which reaches the end of its usefulness may cause a drilling trouble. Conducting a periodic wear check is recommended.

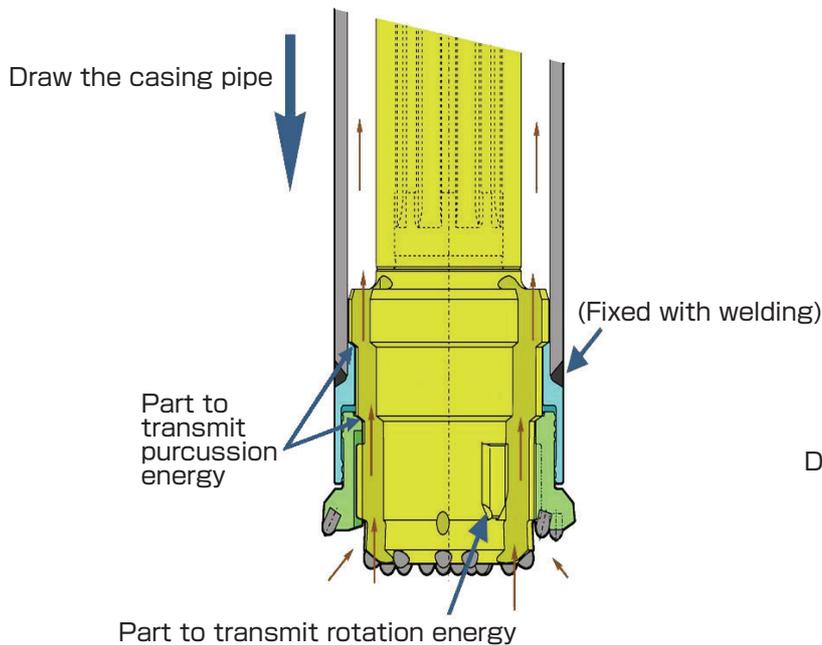
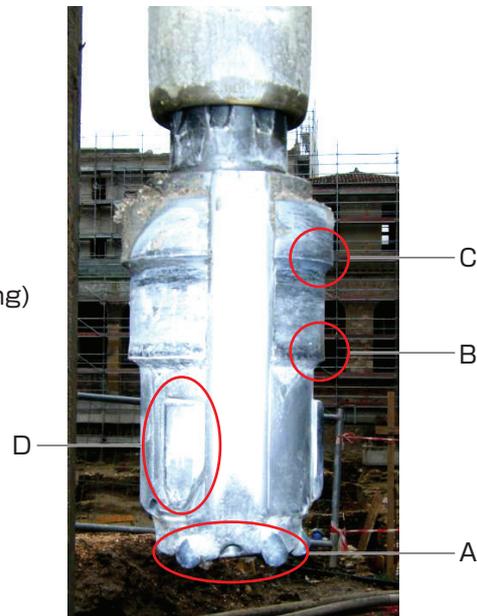


Fig.-20



Pic.-4

### 《Major wear check points》

#### A : Button tip and base material

- ① If the wear width at the tip end is half of the chip diameter or less, regrind the tip end.
- ② If the base material around the tip is worn and in a pycorhea-like condition, tip retention decreases and pop outs will occur.

#### B : Part to transmit percussion energy to ring bit

- ① Use the template to check the wear. 15mm of wear width on the part to transmit the percussion energy indicates it has reached the end of its lifetime.
- ② Abnormal wear is mainly caused by tough drilling conditions and improper use of the system.
- ③ Remove the burr on the angle of the part with a grinder.

#### C : Shoulder (part to transmit percussion energy to casing shoe)

- ① Use the template to check the wear. 15mm of wear width on the part to transmit the percussion energy it has reached the end of its lifetime.
- ② Abnormal wear can be caused by hole deviation or a bent pipe.
- ③ Remove the burr on the angle of the part with a grinder if any.

#### D : Part to transmit rotation energy to ring bit

- ① Wear to the half of the spline width indicates it has reached the end of its lifetime.
- ② Abnormal wear can be caused by improper locking or reaching the end of the ring bit lifetime.

## Checking wear at part to transmit percussion energy

Use the checking template to check the wear.  
 15mm of wear width indicates it has reached the end of its lifetime.  
 Stop using the product this if so.

### 《Fitting the template》

Set the corner of the template to the reference edge of the protrusion as shown in Fig.-21.

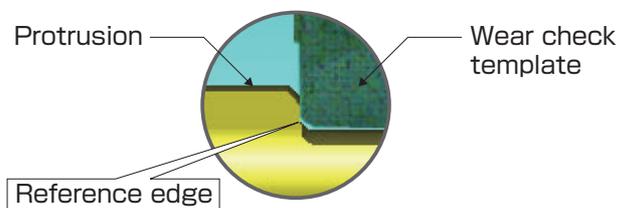
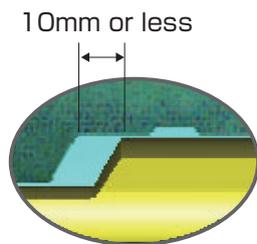


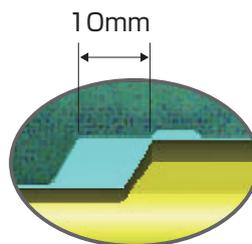
Fig.-21

### 《Criterion for end of lifetime》

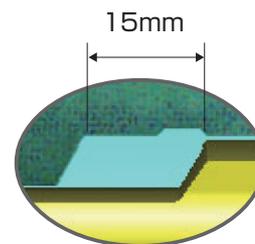
The wear width reaching the mark of wear limit (a concave) indicates end of the production lifetime as shown in Fig.-25.



Initial to medium-term wear  
Fig.-23



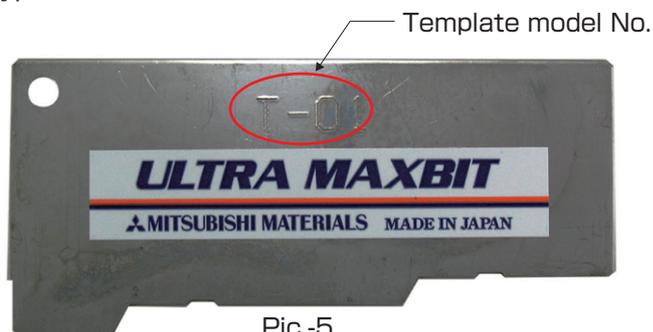
Wear to be noted  
Fig.-24



Wear limit (End of lifetime)  
Fig.-25

### 《Model of template》

Use a template with a proper model No. for each type as shown in Table-1.



Pic-5

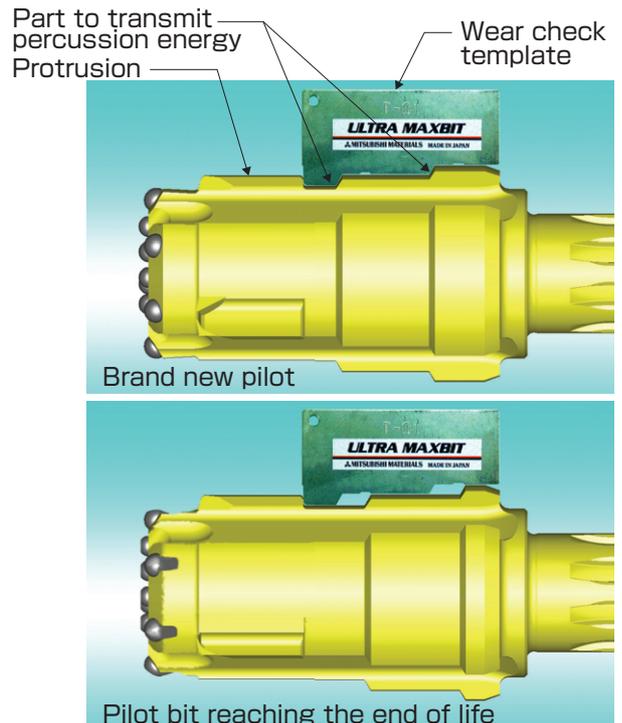


Fig.-22

Table-1

Model No.	Applicable type of pilot bit
T-01	050A, 072A, 097A, 105A, 110A
T-02	116A
T-03	118A, 127A, 127B, 232A
T-04	126A, 128A, 170A
T-05	132A, 151A
T-06	140A
T-07	143A, 270A, 273A, 281A
T-08	167A, 192A
T-09	165A, 216A, 219A, 228A, 270A
T-10	215A, 265A, 300A
T-11	396A
T-12	240A
T-13	157A, 200A, 223A, 354A

## ◆ Build up Welding Repair of Pilot Bit

While the pilot bit adopts a heat-treated special steel to obtain high abrasion resistance, this special steel is not suitable for build up welding repair of the worn product. The following describes the build up welding repair procedure. Carefully follow the procedure to perform the build up welding repair.

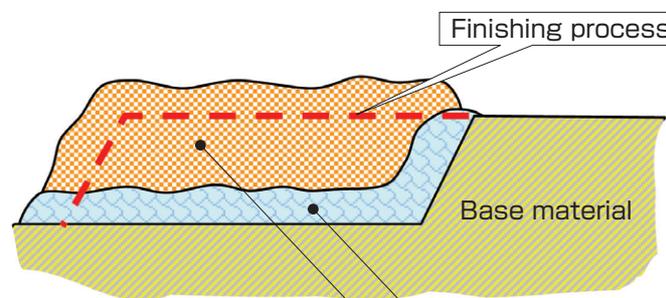
Trouble such as a weld crack can be caused.

**A product repaired with the build-up welding can not be guaranteed.**

《Build-up welding repair procedure.》

- ① Pre-heat the base material to 200 to 300°C.
- ② Underlay a stainless material letting it penetrate shallowly for the first layer.
- ③ Weld the second layer and later one with a hardening built-up weld solvent.
- ④ Gradually cool the pilot bit (Never rapidly cool it.)
- ⑤ Apply a finishing process.

(Surface the repair area along with the abrasion check template.)



(Note)  
To avoid the tip from being exposed to the welding spatter, wind a wet towel around the face side of bit.

Fig.-26

D309,D316 (JIS Z 3221)

DF2A hardness 300 or higher (JIS Z 3251)

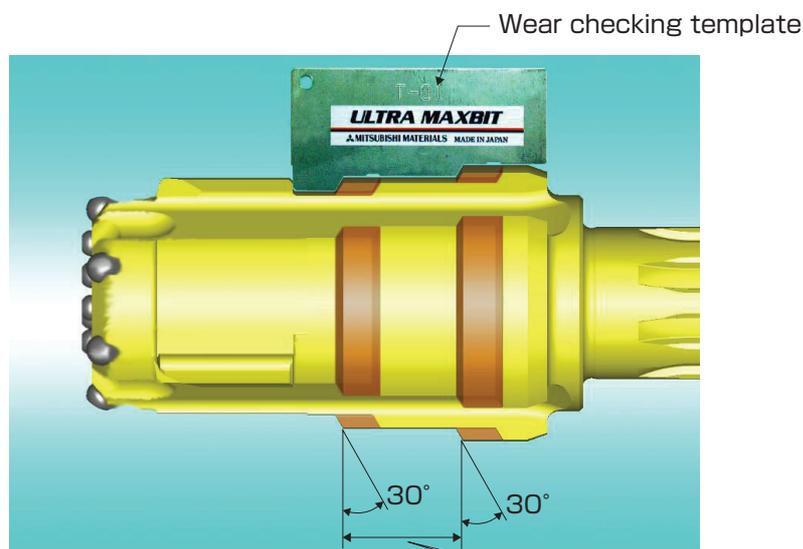


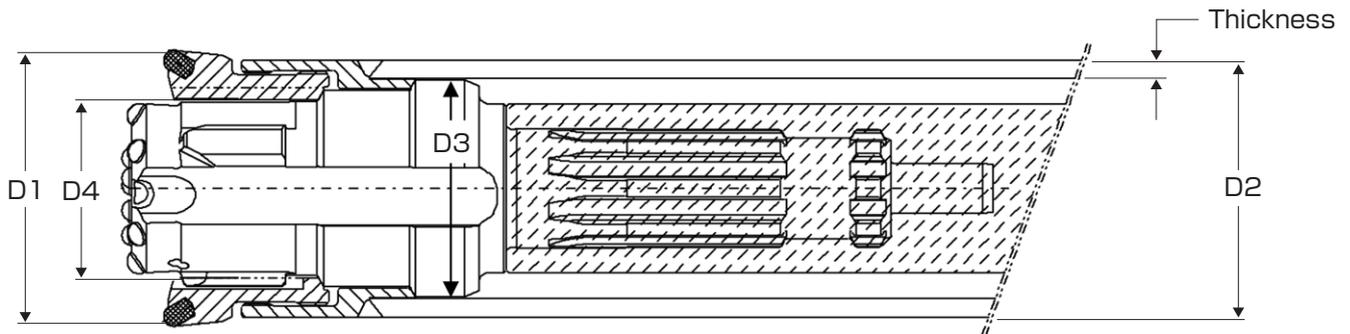
Fig.-27

These angles and the length here shall match the template.

# ULTRA MAXBIT



## ULTRA MAXBIT Order Sheet



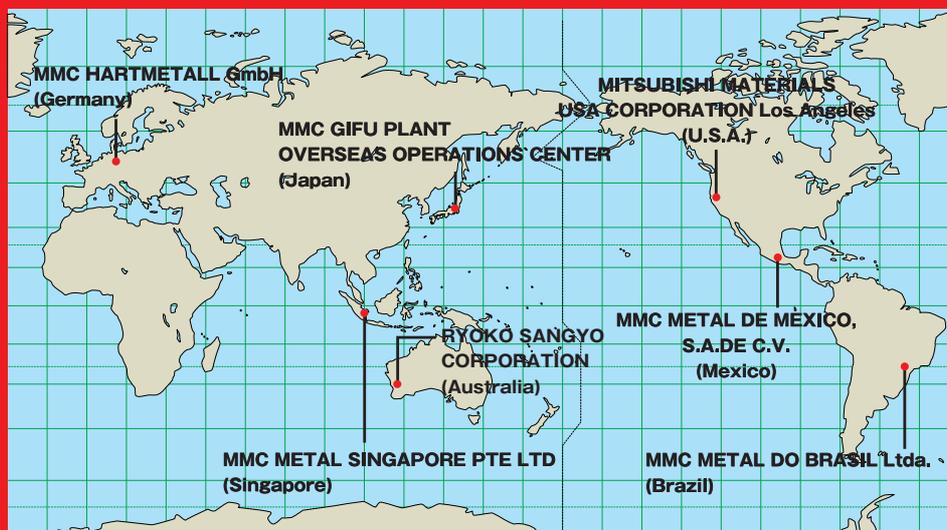
User Name			
Usage			
"DTH Model No. or Thread type"			
Rotation direction at drilling	Right	Left	
Drilling Direction	Vertical	Horizontal	Diagonal (angled)
Casing pipe	Outer diameter (D2)	Wall thickness	
Ring Bit Model	Single pass	Normal	Multi use
Ring Bit O.D.	(D1)	Manufacturer's recommendation	
Ring Bit I.D.	(D4)	Manufacturer's recommendation	
Maximum O.D. of Pilot Bit	(D3)	Manufacturer's recommendation	
Quantity demanded	Drilling meter / Number of hole		
Minimum order quantity	Pilot Bit:	Ring Bit & Casing Shoe:	
Expected Delivery Time			
Remark	Information such as geological conditions, conventionally used bit (a manufacturer), size of passing through bit gauge and hammer type;		

<Contact>

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Name of preparer

Phone number



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 E-Mail. eric-mmc@wanadoo.fr

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